
# Guidance for UIC Wells that Manage Stormwater

**DRAFT**

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Prepared by:

Washington State Department of Ecology
Water Quality Program

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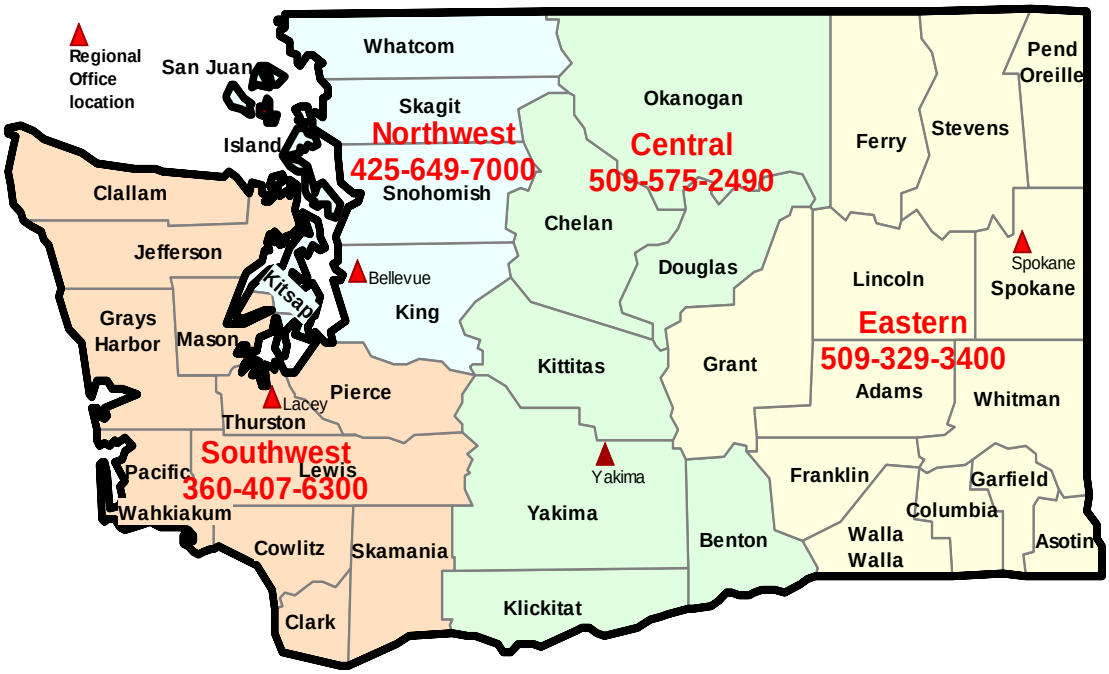


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# Acknowledgements

# Chapter 1 – Introduction

Stormwater is the water from rainstorms or snow melt that runs over land into ponds, lakes, streams, wetlands, drainage ditches, evaporation ponds and drywells. Stormwater also runs off directly into the Pacific Ocean and Puget Sound.

On the way, stormwater contacts surfaces that can pollute. Roads and parking lots can contribute oils and metals. Roofs on industrial buildings can collect chemicals that are vented out of the building and wash off when it rains. Grassy areas, like golf courses, cemetaries and play fields may contribute fertilizers and pesticides.

Stormwater is managed both to prevent flooding and to prevent water pollution. Drainage systems are designed to prevent flooding, and treatment systems are designed to control pollution. For chemicals that are not easy to remove from stormwater, pollution control means going to the source and preventing it from contacting stormwater in the first place. The methods of preventing stormwater pollution are referred to as "best management practices."

This document provides technical guidance for stormwater wells regulated under the Underground Injection Control (UIC) program. For convenience, we will refer to these as UIC wells.

The Underground Injection Control program was created by Congress to protect underground sources of drinking water from discharges of fluids to the ground. The UIC Program in the state of Washington is administered by the Department of Ecology. In 1984, the Department of Ecology adopted Chapter 173-218 WAC - Underground Injection Control to implement the program.

The two basic requirements of the UIC Program are:

- Register UIC wells with the state.
- Make sure that current and future underground sources of ground water are not endangered by pollutants in the discharge (non-endangerment standard).

Stormwater can contain contaminants such as oil and grease, pathogens, nitrates, pesticides, and metals such as cadmium, chromium, and lead. When stormwater is infiltrated into the ground, these contaminants can pollute ground water.

Pollution of ground water from stormwater discharges can be prevented by how the UIC well is designed, where it is sited, how it is operated and maintained, by use of treatment before discharge to the sub-surface, and by reducing the stormwater contact with potential sources of contamination. These methods are covered in this technical guidance.

## *1.1 Development of this technical guidance*

The UIC rule was revised in 2005 in consultation with the UIC Rule Advisory Committee. The UIC rule was adopted and became effective on February 3, 2006. A subcommittee of the Stormwater Management Manual Committee for Eastern WA developed the draft version of this document with statewide stakeholder input and public review. This document was originally published as interim technical guidance in Ecology Publication Number 04-10-076, the *Stormwater Management Manual for Eastern Washington*.

Since UIC wells are used in both the east and west side of Washington State, this document is now being published independently of the western and eastern Washington stormwater manuals and will be used statewide. Therefore, this guidance replaces the section in the Department of Ecology *Stormwater Management Manual for Eastern Washington*, Section 5.6 that refers to UIC wells; however, the rest of the manuals apply.

When using this document, please refer also to the Department of Ecology stormwater management manuals for eastern and western Washington. Other stormwater management manuals approved by the Department of Ecology may be used instead.

## *1.2 Application and Limitations*

### 1.2.1 Definition of a UIC Well

A UIC facility (UIC well) is a manmade subsurface fluid distribution system consisting of an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to infiltrate fluids into the ground or a dug hole that is deeper than the largest surface dimension (WAC 173-218-030).

Subsurface infiltration systems include drywells, pipe or French drains, drain fields, and other similar devices that are designed to discharge stormwater directly into the ground.

For convenience, this document refers to all such facilities as "UIC wells."

**The following are not UIC wells.**

- Buried pipe and/or tile networks that serve to collect water and discharge that water to a conveyance system or to surface water.
- Surface infiltration basins and flow dispersion stormwater infiltration facilities.
- Infiltration trenches designed **without** perforated pipe or a similar mechanism.

  *If infiltration trenches **with** perforated pipe are designed, constructed, operated, and maintained according to the specifications of the Department of Ecology stormwater management manuals or other manuals approved by the Department of Ecology, they do not have to meet the criteria in this guidance and will be rule-authorized after they are registered.*

### 1.2.2 Using a UIC Well for Stormwater Discharges

This guidance document applies to UIC wells that receive stormwater.

A UIC well may be used to manage stormwater when pollutant concentrations that reach ground water are not expected to exceed Washington State ground water quality standards (Chapter 173-200 WAC). This guidance document describes conditions and requirements that are expected to result in meeting these standards.

UIC wells may be used for overflow from a stormwater facility that is greater than the runoff treatment design storm without further treatment.

### 1.2.3 Prohibitions

Stormwater from areas listed below **may not** be discharged to UIC wells because of the potential to contaminate ground water.

Stormwater from these areas must be handled on site with a closed-loop system or discharged to the sanitary sewer if allowed by the local jurisdiction.

Conventional stormwater treatment is not considered protective of ground water in these situations.

*Stormwater from other portions of the site that do not contact the areas listed below, such as roofs and parking areas, may be discharged to UIC wells. The requirements for roofs and parking areas described elsewhere in this document must be met.*

**Stormwater discharge prohibition areas**

- Vehicle maintenance, repair and servicing
- Commercial or fleet vehicle washing
- Airport de-icing activities
- Storage of treated lumber
- Storage or handling of hazardous materials
- Generation, storage, transfer, treatment or disposal of hazardous wastes
- Handling of radioactive materials
- Recycling facilities (unless limited to glass products)
- Industrial or commercial areas without management plans for proper storage and spill prevention, control, and containment appropriate to the types of materials handled at the facility (see the Department of Ecology stormwater management manuals for information on stormwater pollution prevention plans and source control).

# Chapter 2 – How UIC Stormwater Wells are Regulated

## 2.1 Registration

Registration is required for all UIC wells. The form is included in Appendix C. The registration provides the department with information needed to determine if a UIC well meets the conditions to be rule-authorized. Chapter 173-218 WAC lists the submittal requirements.

Residential UIC wells used for roof runoff or basement flood control automatically meet the non-endangerment standard, are considered rule authorized, and are exempt from registering.

The project proponent should begin the registration process during the design phase and submit the completed paperwork prior to first use of the UIC facility.

## 2.2 Rule-authorization or Permit

UIC wells must either be rule-authorized or covered by a state waste discharge permit. If a UIC well is rule-authorized, a permit is not required. Stormwater UIC wells are normally rule-authorized.

Rule-authorization can be rescinded if a UIC well no longer meets the non-endangerment standard. The department can also require corrective action or closure of a UIC well that is not in compliance.

A UIC well may be rule-authorized when both of the following requirements are met:

1. A registration form must be submitted to the Department of Ecology.
2. Discharge from the UIC must not contaminate ground water. This is the "non-endangerment performance standard."

The requirements to meet the non-endangerment standard are detailed in this guidance document.

## 2.3 Meeting the Non-Endangerment Standard

The Department of Ecology makes the decision that a UIC well is either rule-authorized or needs a permit based on whether the UIC well meets the non-endangerment standard.

There are two ways for a registrant of a UIC well to show that the well meets the non-endangerment standard and therefore, isn't required to have an individual permit.

- One way is to follow the requirements in this technical guidance. The Department of Ecology will **presume** that the UIC well meets the non-endangerment standard and the well will be rule-authorized. This called the "**presumptive approach**."

- The other way is for the registrant to **demonstrate** that the non-endangerment standard has been met in some other way. This is called the "**demonstrative approach**." This is designed to allow alternative methods to demonstrate that the non-endangerment standard has been met and therefore the UIC well may be rule-authorized.

Each of these methods is described in more detail below.

### 2.3.1 Using the Presumptive Approach

To be eligible for rule-authorization using the presumptive approach, the following topic areas must be documented with the UIC well registration using this guidance or another stormwater manual that has been approved by the department.

- The potential pollutant loading expected in the stormwater runoff.
- Source control of pollutants, especially those that are difficult to remove from stormwater by filtration, settlement, or other treatment technologies.
- Known treatment methods.
- The potential treatment capacity of the vadose zone.
- Siting.
- Design.
- Operation and Maintenance.

Local governments may adopt a stormwater management program that meets the non-endangerment standard based on local information and planning. If the local manual has been approved by the department, UIC well registrants may use it for the above documentation.

### 2.3.2 Using the Demonstrative Approach

The documentation for the demonstrative approach is a site-specific analysis that demonstrates that the proposed discharge will comply with ground water quality standards.

To be eligible for rule-authorization using the demonstrative approach, the following topic areas must be documented with the UIC well registration.

- Site-specific analysis of pollutant loading.
- Site-specific analysis of the treatment capacity of the vadose zone, if used for treatment.
- How stormwater best management practices (BMPs) were selected.
- Pollutant removal expected from the selected BMPs.
- Technical basis supporting the performance claims for the selected BMPs.
- Assessment of how the selected BMPs will comply with state ground water quality standards and satisfy state AKART requirements.

# Chapter 3 – Siting

Prior to evaluation of the water quality considerations, project proponents should be certain that the site meets either the criteria set forth below or appropriate alternative criteria set forth by the local jurisdiction. These criteria apply to new UIC wells.

A site may be unsuitable for a UIC well for a number of reasons. The following shall be considered when evaluating a site for suitability.

## *3.1 Setbacks*

Setback requirements are generally required by local regulations, building code requirements, or other state regulations. The following setback criteria are provided as guidance.

- Drinking water sources. At least 100 feet from drinking water wells and springs used for public drinking water supplies.
- At least 100 feet from septic tanks or drain fields.
- **UIC wells up-gradient of drinking water supplies and within six-month and one -, five-, and ten-year time of travel zones,** and special zones must comply with Health Department requirements (Washington Wellhead Protection Program, DOH, 12/93).
- Additional setbacks must be considered if roadway de-icers or herbicides are likely to be present in the influent to the infiltration system.
- At least 100 feet up-slope and 20 feet down-slope from building foundations.
- At least 20 feet from a Native Growth Protection Easement (NGPE).
- The design professional should carefully consider and evaluate any situation where a UIC well will be situated up-slope from a structure or behind the top of a slope inclined in excess of 15 percent. The minimum setback from such a slope is equal to the height of the slope, unless the design professional can justify a lesser setback based on a comprehensive site evaluation.

## *3.2 Other Siting Considerations*

### 3.2.1 Groundwater protection areas

When siting UIC wells, check with the local jurisdiction to find out if there are further requirements.

Local government may have ordinances that apply to development within groundwater protection areas, such as sole source aquifers, groundwater management areas, near public water supply wells, and in areas designated as Critical Aquifer Recharge Areas. For more information about well-head protection areas and Critical Aquifer Recharge Areas, consult with your local jurisdiction.

The direction and rate of groundwater movement, how far your facility is from a well, and the vulnerability of drinking water supply wells to contamination should be considered when siting UIC facilities.

A site is not suitable if the infiltration facility will cause a violation of Washington State ground water quality standards.

Evaluate on-site and off-site structural stability due to extended sub-grade saturation and/or head loading of the permeable layer, including the potential impacts to down-gradient properties, especially on hills with known side-hill seeps.

### 3.2.2 Unstable soil

The designer should also determine if the soil beneath the proposed infiltration facility is unstable, due to improper placement of fill, subsurface geologic features, etc. If so, further investigation and planning should be undertaken prior to siting of the facility.

The effect of the infiltrated water on structures and neighboring properties needs to be evaluated. This is especially important on hills with known seeps.

### 3.2.3 Contaminated soil

UIC wells should not be sited where there are soil contaminants that could be transported to ground water unless the site is remediated prior to construction of the UIC well.

The design professional should investigate whether the soil under the proposed infiltration facility has contaminants that could be transported by infiltration from the facility. If so, the site should be remediated prior to construction of the UIC well, or an alternative location should be chosen.

# Chapter 4 – Design and Construction

The UIC well and any associated pre-treatment facilities must be constructed in accordance with local jurisdiction requirements or following the guidance in the Department of Ecology stormwater management manuals.

All UIC wells must be protected during the construction phase to prevent sediment from entering the UIC well. See Ecology stormwater management manuals for necessary source controls to prevent other pollutants from entering the UIC well during the construction phase of a project.

## *4.1 Soil infiltration rate and drawdown time*

The water quality design runoff treatment storm volume is the amount of runoff predicted from the 6-month, 24-hour storm. The purpose of the flow control "design storm" is to design a facility that accommodates the runoff expected from a typical large storm event.

The amount of time it takes for water to drain out of a UIC well depends on how fast the soil allows water to infiltrate and how much water the UIC well holds.

The **soil infiltration rate** is the amount of water that infiltrates into the ground in a specified amount of time, usually in inches per hour.

The **drawdown time** is the amount of time it takes for water to drain out of the UIC well, and depends on the construction of the well and the infiltration rate.

In most cases, facilities are designed to completely drain ponded runoff from the flow control design storm within 48 to 72 hours after flow to the UIC facility has stopped.

If the UIC facility is designed to meet a runoff treatment requirement by meeting the pollution loading and vadose zone treatment capability requirements, the long-term infiltration rate, as determined under the worst-case scenario, must be sufficient to accommodate the water quality runoff treatment design storm identified in the Department of Ecology stormwater management manual or other manuals approved by the Department of Ecology for the site location

## *4.2 Depth to bedrock, water table, or impermeable layer*

The base of all UIC facilities should be five feet above the seasonal high-water mark, bedrock (or hardpan) or other low permeability layer, except as noted below.

A separation down to three feet may be considered if the groundwater mounding analysis, the volumetric water holding capacity of the zone receiving the water, and the design of the overflow and/or bypass structures are judged by the design professional to be adequate to prevent overtopping and meet the site suitability criteria specified in this section.

## 4.3 Design Criteria for All UIC Wells

UIC wells must be designed in accordance with the Department of Ecology stormwater management manuals and local jurisdiction requirements.

Pre-treatment facilities must be designed in accordance with the criteria established in the Department of Ecology stormwater management manuals, in another manual or document approved by the Department of Ecology, or by local jurisdictions.

## 4.4 Design Criteria for Infiltration Drywells

Drywells convey stormwater runoff into the soil matrix. Typically, drywells are pre-cast concrete structures that are a minimum of 48 inches in diameter and approximately five to ten feet deep, or more. They may be used as stand-alone structures, or as part of a larger drainage system, such as the overflow for a bio-infiltration swale or other stormwater treatment BMP

Dry Well

Bioswale

- Drywell bottoms should be a minimum of five feet above the seasonal high groundwater level, impermeable soil layers, or bedrock.
- Filter fabric (geotextile) may need to be placed on top of the drain rock and on trench or drywell sides prior to backfilling to prevent migration of fines into the drain rock, depending on local soil conditions and local jurisdiction requirements.
- Drywells should be no closer than 30 feet center to center or twice the depth, whichever is greater.
- Drywells should not be built on slopes greater than 25 percent (4:1).
- Drywells may not be placed on or above a landslide hazard area or slopes greater than 15 percent without evaluation by a professional engineer with geotechnical expertise or qualified geologist and jurisdiction approval.
- Check with the local jurisdiction for outflow capacity requirements.

# Chapter 5 – Operation and Maintenance

UIC wells must be operated and maintained in accordance with state or local jurisdiction requirements. Pre-treatment facilities must be operated and maintained in accordance with the criteria established in this document, in another manual or document approved by Ecology, or by local jurisdictions.

- Pre-treatment for solids removal is recommended to ensure protection of long-term infiltration capacity and reduced frequency of maintenance.
- Pre-treatment will also reduce the long-term accumulation of contaminants in the vadose zone.
- Frequent inspections and regular maintenance will improve the long-term performance of the facilities.

**Maintenance Criteria for Drywells**

Remove debris and sediment from the drywell grate on a semi-annual basis, or as required to prevent the buildup of materials that could inhibit infiltration. Maintain any pre-treatment facility according to the requirements for that particular BMP.

# Chapter 6 - Potential Contaminants in Stormwater Runoff

Urban areas and roads may contribute to stormwater contamination. A review of available urban and road runoff data provides information about the following potential pollutants:

| Potential Contaminant | Typical Concentration in Stormwater | Treatment BMP | Expected % Reduction | Hypothetical Concentration after Treatment | GW Standard |
|---|---|---|---|---|---|
| Cadmium | | | | | **5 ug/L** |
| Chromium | | | | | **50 ug/L** |
| Lead | | | | | **50 ug/L** |
| Iron | | | | | **0.30 mg/L** |
| Arsenic | | | | | **0.05 ug/L** |
| Copper | | | | | **1 mg/L** |
| Zinc | | | | | **5 mg/L** |
| Fecal coliform and E.coli. | | | | | 0 |
| **Atrazine** | | | | | **3 ug/L** |
| **PAH (Polyaromatic hydrocarbons)** | | | | | **0.01 ug/L** |
| Chloride | | | | | **250 mg/L** |
| **Nitrogen, total [includes: ammonia, nitrate (as N), nitrite (as N) & organic nitrogen]** | | | | | **10 mg/L** |

- **Cadmium, chromium, lead, iron, and arsenic**

  These metals are potential pollutants of concern. Most of the suspended portion of the total concentrations of these metals in urban and road runoff may be removed by settling or filtration, leaving typical dissolved fractions that are expected to meet state ground water quality standards.

  A notable exception is arsenic, which also is known to be naturally present at levels of concern in ground water in many areas of Washington State.

- **Copper, zinc, and total suspended solids**

  Typical concentrations in urban and road runoff do not generally appear to be an issue of concern for meeting Washington State ground water quality standards.

- **Coliform bacteria, and other pathogens**

  Concentrations in urban and road runoff commonly exceed ground water quality standards, and may exceed the capacity of the vadose zone to remove bacteria to a level that meets standards.

  Filtration and separation from ground water are considered the most effective means of removing coliform bacteria. Currently existing runoff treatment technologies have mixed **and unreliable results in addressing this issue.**

- **Oil, grease and polynuclear aromatic hydrocarbons (PAHs), and fuel additives**

  Oil, grease and PAHs are of potential concern, particularly in the event of a large spill reaching an unprotected UIC well. Fuel additives are also of concern, as they may travel great distances in groundwater.

- **Pesticides and nitrates**

  Pesticides and nitrates may be a concern in areas where landscapes are intensively managed. Pesticides that are water soluble and nitrates are very difficult to remove from stormwater.

- **Chloride**

  Typical concentrations of chloride in urban and road runoff do not generally appear to be an issue of concern for meeting Washington State ground water quality standards. Frequent use of road salts and other de-icers and anti-icers may result in pollutant concentrations that exceed ground water quality standards.

  No runoff treatment technology currently exists to address this issue in a practical manner.

- **Phosphorus**

  Typical concentrations of phosphorus in urban and road runoff do not generally appear to be an issue of concern for meeting Washington State ground water quality standards. Phosphorus in ground water may still be a concern in small lake watersheds.

**Table 6.1: Common Pollutants in Stormwater and Some Potential Sources[1]**

| Pollutant | Potential Sources |
|---|---|
| Lead | Motor Oil, Transmission Bearings, Gasoline[2] |
| Zinc | Motor Oil, Galvanized Roofing, Tire Wear, Down Spouts |
| Cadmium | Tire Wear, Metal Plating, Batteries |
| Copper | Brake Linings, Thrust Bearings, Bushings |
| Chromium | Metal Plating, Rocker Arms, Crank Shafts, Brake Linings, Yellow Lane Strip Paint |
| Arsenic | ASARCO Smelter, Fossil Fuel Combustion |
| Bacterial/Viral Agents | Domestic Animals, Septic Systems, Animal & Manure Transport |
| Oil & Grease | Motor Vehicles, Illegal Disposal of Used Oil |
| Organic Toxins | Pesticides, Combustion Products, Petroleum Products, Paints & Preservatives, Plasticizers, Solvents |
| Sediments | Construction Sites, Stream Channel Erosion, Poorly Vegetated Lands, Slope Failure, Vehicular Deposition |
| Nutrients | Sediments, Fertilizers, Domestic Animals, Septic Systems, Vegetative Matter |
| Heat | Pavement Runoff, Loss of Shading Along Streams |
| Oxygen Demanding Organics | Vegetative Matter, Petroleum Products |

[1] Adapted from a number of sources: Novotny, V. and G. Chesters, 1981. Handbook of Nonpoint Pollution. Van Nostrand Reinhold Company, New York, p. 322. Galvin D. and R. Moore, 1982. Toxicants in Urban Runoff, METRO Toxicant Program, Report #2. METRO, Seattle, pp 3-89 - 3-92. PTI Environmental Services, 1991. Pollutants of concern in Puget Sound. Puget Sound Estuary Program, U.S. EPA, Seattle, pp 47-51. URS et al, 1988. City of Puyallup, Stormwater Management Program. Technical Memorandum WQ-1: Stormwater Quality Issues. Table 1.

[2] Although lead is no longer an additive to gasoline, it is still present in trace amounts and remaining lead on the ground is picked up by stormwater runoff.

# Chapter 7 – Source Control, Pre-Treatment and Vadose Zone Treatment Requirements

Source control and treatment requirements are based on the types and quantities of pollutants expected from the proposed land use contributing storm runoff to the UIC well.

A UIC well is presumed to meet the non-endangerment standard and is rule-authorized if the guidelines in this document are followed, based on one or more of the following:

(1) Source control measures to control loading of pollutants that are difficult to remove from stormwater by filtration, settlement, or other treatment technologies

(2) Pre-treatment to remove pollutants before stormwater is discharged into the UIC well.

(3) Vadose zone treatment capacity to remove the solid phase of pollutants in stormwater by filtration and adsorption.

## *7.1 Source Control*

Source control BMPs can significantly reduce target pollutants, especially solids, from many sites and should be employed at all project sites.

Where there are no currently existing stormwater treatment technologies to practically address a pollutant issue, and where filtration by the vadose zone cannot provide adequate removal of pollutants, source controls must be used to meet the non-endangerment standard.

Source control is necessary to protect ground water from pathogens, pesticides, nitrates, road salts and other anti-icers and deicers, fuel additives, many other pollutants in urban runoff, and accidental spills.

Wherever practicable, exposure of stormwater to these contaminants should be reduced by one or more of the following:

- Reduction in application rate or more selective use
- Increased source control activities
- Separation of the areas of use from the contributing area draining to the UIC well
- A spill response plan

Source control best management practices required to meet the nonendangerment standard may be found in:

- Chapter 8 of the Stormwater Management Manual for Eastern Washington (Department of Ecology Publication # 04-10-076) or
- Volume IV of the Stormwater Management Manual for Western Washington (Department of Ecology Publication # 99-14), or
- Other approved manuals

Contact the local jurisdiction to determine whether specific source control requirements apply to your project in addition to those methods described in Ecology stormwater management manuals for the proposed land use.

### 7.1.1 General guidelines for spills and illegal dumping

- UIC wells should be inspected regularly to check for unreported spills.

- All spills must be reported to the Department of Ecology. See http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm or Appendix B.

- In the event that a spill occurs and spreads through the vadose zone, the owner or operator must remove and properly dispose of the contaminated soils and replace them with clean materials as soon as practicable.

> Depths greater than 25 feet are difficult to clean up with soil removal equipment. If removal of deeper contaminated sediments is not practical, remediation and long-term groundwater monitoring may be required. Spill control can help avoid the high costs and difficulties associated with cleanup.

- Local or state authorities may prohibit the use of UIC wells in subject to frequent spills or illegal dumping.

  These may be areas where incidents have occurred or where there is sufficient evidence that a UIC well would be an attractive nuisance for illegal dumping. For example, UIC wells at many auto parts shops, restaurants and food processing facilities have been subject to frequent illicit discharges by customers or employees.

  Designers should discuss potential problems with their clients and take care to locate UIC wells to minimize easy, unobtrusive access for illegal dumping. Employee training will help to reduce these incidents.

### 7.1.2 Spill Containment Structures

At high vehicle traffic areas, at fueling stations and other facilities where fueling activities take place, and at areas where petroleum products are stored and/or transferred in amounts greater than 1,500 gallons per year, the UIC well must:

- Include a spill containment structure and

- A spill prevention control and containment plan (see stormwater management manual).

High vehicle traffic areas are:

- Commercial or industrial sites subject to an expected average daily traffic count (ADT) ≥ 100 vehicles/1,000 ft² gross building area (trip generation).
- Road intersections with an ADT of ≥ 25,000 on the main roadway, or ≥ 15,000 on any intersecting roadway.

### 7.1.3 Spill Control Devices

At all other high-use sites, the UIC well must include a spill control device, such as a turned-down pipe elbow or other passive device. These high-use sites include:

- All roads with ADT equal to or greater than 30,000 vehicles per day.
- Parking areas with trip end count equal to or greater than 300 vehicles or 100 trips ends per 1,000 square feet of gross building area.
- Commercial on-street parking areas on streets with an expected total ADT count equal to or greater than 7,500.
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.).
- A commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year (does not include locations where heating fuel is routinely delivered to end users and the annual amount of heating oil used at the site is the sole basis for the site meeting this definition; except for heating fuel handling and storage facilities).
- Maintenance and repair facilities for vehicles, aircraft, construction equipment, railroad equipment, or industrial machinery and equipment.
- Fueling stations and facilities.
- Outdoor areas where hydraulic equipment is stored.
- Log storage and sorting yards and other sites subject to frequent use of forklifts and(or) other hydraulic equipment.
- Railroad yards.

A spill response plan and employee training are required to reduce the risk of stormwater contamination.

### 7.1.4 Evaluating the Need for Spill Containment Structures or Control Devices for Other Situations

A spill containment structure or spill control device should be used if in the designer's judgment spills are likely during the life of the project (see stormwater management manual).

Impervious surfaces contributing stormwater to UIC structures should be evaluated for risk of exposure to potential spills.

For **traffic surfaces**, the designer should consider whether any of the following conditions are present.

- The bottom of a steep hill.
- A dangerous intersection.
- A sharp turn in a road.
- Other locations where traffic accidents are likely to occur.
- Roads in industrial areas or with frequent daily travel by tanker trucks.
- Some other increased risk situation that might increase the potential for accidental spills.

For **commercial and industrial sites**, the designer should consider:

- The types of materials that will be handled and stored at the site.
- Site layout and spill response plans.
- Probable employee training and preparation for responding to a spill
- Protecting the UIC well from receiving spilled material.

In general, response to spills on roadways will be delayed, but response to an on-site spill at a well-prepared facility can be almost immediate.

## *7.6 Pre-Treatment*

The best management practices chosen for the site must remove or attenuate the target pollutants to levels that will comply with state ground water quality standards when the discharge reaches the water table or first comes into contact with an aquifer (see WAC 173-200). Each best management practice is designed to reduce or eliminate certain pollutants. See Ecology's stormwater management manuals to determine the required best management practices that apply to the pollutants at your site.

These best management practices include filtration and bio-infiltration, water quality vaults and wetpools, oil/water separators, manufactured devices (such as catch basin inserts, media filters and other emerging technology), and other approved facilities that provide treatment of expected pollutants (using filtration, adsorption, or sedimentation processes) for flows up to the water quality design storm.

Alternatively, project proponents may request conditional approval from Ecology for a new or experimental treatment method following the protocol described in Ecology stormwater management manuals.

### 7.6.1 Preserving Infiltration Rates

Removing solids from stormwater runoff before it is discharged to a UIC well helps preserve infiltration rates over the long term. UIC wells used for flow control are

required to have solids removed prior to discharge. Pre-treatment for solids removal must be designed, constructed, operated and maintained in accordance with the appropriate stormwater manual.

### 7.6.2 Pathogens

Coliform bacteria and other pathogens in stormwater come from numerous sources.

Municipalities must identify and address failing septic systems and improperly connected sewer lines that contribute flows to their UIC wells. Municipalities must also educate appropriate target audiences about preventing pet wastes from entering their UIC wells. (These are among the requirements of the NPDES Phase II stormwater permit.)

Private well owners must ensure that their UIC wells are appropriately protected from sources of bacterial contamination.

Where a UIC well discharges to a shallow water table (seasonal high water table less than 15 feet below the bottom of the UIC well) and is less than 100 feet from a drinking water supply well, then pre-treatment for solids removal (called "basic treatment" in Ecology's stormwater management manuals) is required.

Where the treatment capacity of the vadose zone is categorized as "low" or "none" (see Table 7.2 at the end of this chapter), this "basic treatment" requirement extends to UIC wells up to 1,000 feet from drinking water supply wells or less than 100 feet from a surface water body that is impaired due to coliform bacteria.

Due to the unreliability of stormwater treatment facilities in removing coliform bacteria and other pathogens from runoff, UIC wells shall not receive direct stormwater discharges from areas of sites such as concentrated animal feeding operations that generate high coliform bacteria loadings.

Runoff from sites or areas of sites with high bacteria loadings must be directed to the sanitary sewer (if allowed by the local jurisdiction), or used to irrigate crops in accordance with other applicable requirements, or directed to biofiltration or bioinfiltration systems, or diverted through constructed wetlands prior to discharge to UIC wells.

### 7.6.3 Soluble Pollutants

Many soluble pollutants that are commonly found in stormwater (including pesticides, fertilizers, road salts, and other chemical pollutants) are very difficult to remove from stormwater. Source controls applicable to the land use and activities at the site are required in order to reduce the contamination of stormwater with these chemicals.

See Chapter 8 of the *Stormwater Management Manual for Eastern Washington* (Department of Ecology Publication # 04-10-076) or Volume IV of the *Stormwater*

*Management Manual for Western Washington* (Department of Ecology Publication # 99-14) for best management practices applicable to your site.

### 7.6.3.1 Special Requirements

The following land uses, conditions, and activities have special requirements.

*Note that UIC wells may still be employed for parking lots and other impervious areas at these sites in accordance with the treatment and source control requirements for solids, oils, and metals.*

**A. Sites with Pesticides, Fertilizer and Nutrients in Runoff**

Areas such as golf courses, public ball fields, and cemeteries typically use pesticides and fertilizers for landscape management. Examples of other activities that generate high nutrient loads include commercial composting, commercial animal handling areas and nurseries.

Runoff that would violate ground water quality standards because it is contaminated by pesticides or fertilizers and other nutrients should **not** be discharged directly to UIC wells.

Non-biological treatment systems, such as catch basins, are ineffective at removing these pollutants from runoff.

Instead, runoff from these types of landscaped areas should be directed to biofiltration or bioinfiltration systems, or to constructed wetlands prior to discharge to UIC wells. Stormwater with fertilizer or nutrients may be used to irrigate crops in accordance with other applicable requirements.

The following practices are encouraged:

- Limit use of applied chemicals
- Design the site to minimize runoff from the landscaped surface

The term “pesticides” includes a host of chemicals with varying chemical fate and transport characteristics. Some pesticides travel to ground water more readily because they are more water soluble and less likely to “stick” or sorb to particles of earth. These pesticides need to be treated by a biological treatment method, such as a bioswale or constructed wetland. UIC wells that receive stormwater with pesticides that use one of these biological treatment methods are rule-authorized when they are registered, providing this technical guidance is followed.

If a UIC owner wishes to use a different treatment method for pesticides, they may apply to the department for rule-authorization using the demonstrative approach outlined in this guidance.

**B. Sites near Phosphorus-Impaired Surface Waters**

Where a UIC well is located near a surface water body that is impaired due to phosphorus, pre-treatment for removal of phosphorus may be required according to the remediation strategy adopted in a TMDL or other water clean-up plan.
Check with the local jurisdiction for applicable requirements. If phosphorus removal is required, see Ecology stormwater management manuals for more information.

**C. Industrial activities**

The Environmental Protection Agency has listed industrial activities that have monitoring requirements for nitrate, nitrite, ammonia, or phosphorus. This list is reproduced in Appendix A. Runoff from these sites must be directed to one of the following.

- Biofiltration or bioinfiltration systems.
- Constructed wetlands prior to discharge.
- Sanitary sewer if allowed by the local jurisdiction.
- Municipal storm sewer, if allowed by the local jurisdiction and following pre-treatment for removal of solids.

Facilities may complete a “no exposure” certification as part of Ecology’s UIC well registration process to be exempted from these requirements. In order to qualify, no outdoor processing, handling or storage of raw solid materials or finished products may take place at the facility. Industrial facilities that qualify for no-exposure certification may use the tables at the end of this section to determine pre-treatment requirements.

## 7.6.4 Solids, Metals and Oil

### 7.6.4.1 Tables to Determine Treatment Requirements

Where adequate geologic and groundwater depth information are available, Table 7.2, Table 7.3 and Table 7.4 at the end of this chapter can be used to evaluate whether a

stormwater discharge from a road, a commercial site or a residential site to a UIC well is presumed to meet the non-endangerment standard for solids, metals, oil, grease, and PAHs.

Industrial sites with no outdoor processing, storage, or handling of raw or finished products may also use these tables.

Used together, the tables identify the extent to which the vadose zone may be presumed to provide sufficient treatment for a given pollutant loading surface in order to meet ground water quality standards for these pollutants.

At sites where the vadose zone is presumed to provide sufficient treatment to protect ground water quality, treatment is not required prior to discharge to the UIC well.

Table 7.2, Table 7.3 and Table 7.4 at the end of this chapter are intended for use in meeting the requirements of the presumptive approach. Project proponents and local jurisdictions following the demonstrative approach may define other treatment capacity categories and pollutant loading requirements (see section 2.3.2).

#### 7.6.4.2 Treatment requirements

***Commercial roofs***

Roof runoff from commercial establishments with ventilation systems specifically designed to remove commercial indoor pollutants must be evaluated on a case-by-case basis to identify the pollutants of concern and the appropriate pre-treatment requirements. In general, this runoff may be classified as a "medium" pollutant loading source (see Table 7.3 at the end of this chapter), and the requirements of this section may be applied to discharges from these areas to UIC wells.

***Industrial roofs***

Roof runoff from industrial facilities must be evaluated on a case-by-case basis and should be treated according to the other requirements for the facility. These requirements are listed in the (see section 4.3.1 "Special treatment requirements").

#### 7.6.4.3 Oil control

High category pollutant loadings must provide pre-treatment for removal of oil.

High-density intersections and at commercial or industrial sites subject to an expected average daily traffic count (ADT) ≥100 vehicles/1,000 ft² gross building area, sufficient quantities of oil will be generated to justify operation of a separator BMP.

At other high-use sites, project proponents may select a basic runoff treatment BMP that also provides adsorptive capacity, such as a biofiltration or bioinfiltration swale, a filter

or catch basin insert, or other adsorptive technology in lieu of a separator BMP. See Ecology's stormwater management manuals or other manuals approved by the Department of Ecology for more information on these BMPs.

#### 7.6.4.4 Solids Removal

Pre-treatment for solids removal is required:

- At commercial sites with outdoor handling or storage of raw solid materials.
- At industrial sites listed in Appendix A where outdoor processing, handling, or storage of raw solid materials or finished products, including outdoor loading areas for these materials or products, takes place. These are sites defined by EPA (40 CFR 122.26(b)(14)).

  Stormwater associated with construction activities at sites classified as Category (x) under the federal rules are exempt from this requirement.
- When an evaluation of storm runoff from roofs subject to ventilation systems that are specifically designed to remove commercial indoor pollutants identifies the need for pre-treatment for solids removal.

#### 7.6.4.5 Metals Removal

UIC wells located less than 100 feet from a surface water body that is impaired due to metals must use additional pre-treatment for metals removal when the UIC well:

- Requires pre-treatment for solids removal due to the expected pollutant load or the limited treatment capacity of the vadose zone materials (see Table 7.2, Table 7.3 and Table 7.4).
- And discharges to a shallow water table (seasonal high water table less than 15 feet below the bottom of the UIC well).

See the stormwater management manuals for metal removal pre-treatment best management practices.

## *7.7 Vadose Zone Treatment Capacity*

Studies of pollutant concentrations in water through and below infiltration systems show mixed results in the effectiveness of vadose zone filtration in protecting ground water quality (USEPA 1999; Pitt 1999; Mason *et al* 1999; and Appleyard 1993).

Many of the problems documented in these studies can be corrected by proper siting, design and use of the facilities, enhanced source control, additional pre-treatment prior to discharge to the facilities, or prohibition of the discharge.

Studies of sub-surface infiltration systems also indicate that filtered and adsorbed pollutants accumulate in the vadose zone at depths of less than a few feet below the

facilities at concentrations that may require soil cleanup activities upon decommissioning of a UIC well (Mikkelsen *et al* 1996 #1 and #2; Appleyard 1993).

Because contaminated soil removal and disposal costs can be considerable, project proponents may wish to consider including pre-treatment facilities to remove solids from stormwater runoff and avoid potential cleanup requirements following long-term use of the UIC well. This caution is particularly addressed to UIC wells receiving runoff from commercial and industrial areas, and from traffic areas with moderate to high use. For examples of traffic areas with moderate and high use, see Table 7.3.

In general, the vadose zone may provide adequate filtration, adsorption, and other pollutant reduction capacity to meet the non-endangerment standard for solids, metals, oil, grease, and PAHs. The tables at the end of this section may be used to evaluate the use of the vadose zone for treatment and to determine pre-treatment requirements for these pollutants.

### 7.7.1 Classification of Vadose Zone Treatment Capacity

Table 7.2 classifies the treatment capacity of the vadose zone as high, medium, low, and none. These classifications are based on both minimum thickness and the geologic materials that make up the treatment layer.

Several different ways of describing the geologic materials are used, including grain-size distribution, sand-to-fines ration, well log lithology, and geologic names. Examples of these are given in Table 7.1.

Table 7.1: Examples of Geologic Material Descriptions

| Geologic Material Description Method | Example |
|---|---|
| Grain size distribution | Materials with average grain size <0.125mm |
| Sand-to-fines ratio | Having a sand to silt/clay ratio of less than 1:1 and sand plus gravel less than 50% |
| Well log lithology | ■ Sandy or silty clay<br>■ Silt<br>■ Clayey or sandy silt<br>■ Sandy loam or loamy sand<br>■ Silt/clay with inter-bedded sand |
| Geologic name | This category generally includes till, hardpan, caliche, and loess |

The ability of geologic materials to filter or adsorb pollutants such as solids, oils, and metals is related to grain size, the amount of organic matter, and the presence of clays, among other factors. Native organic matter improves adsorption and filtration (Ingloria et. al., 1997) but is rarely found at depths below UIC wells.

## High Treatment Capacity

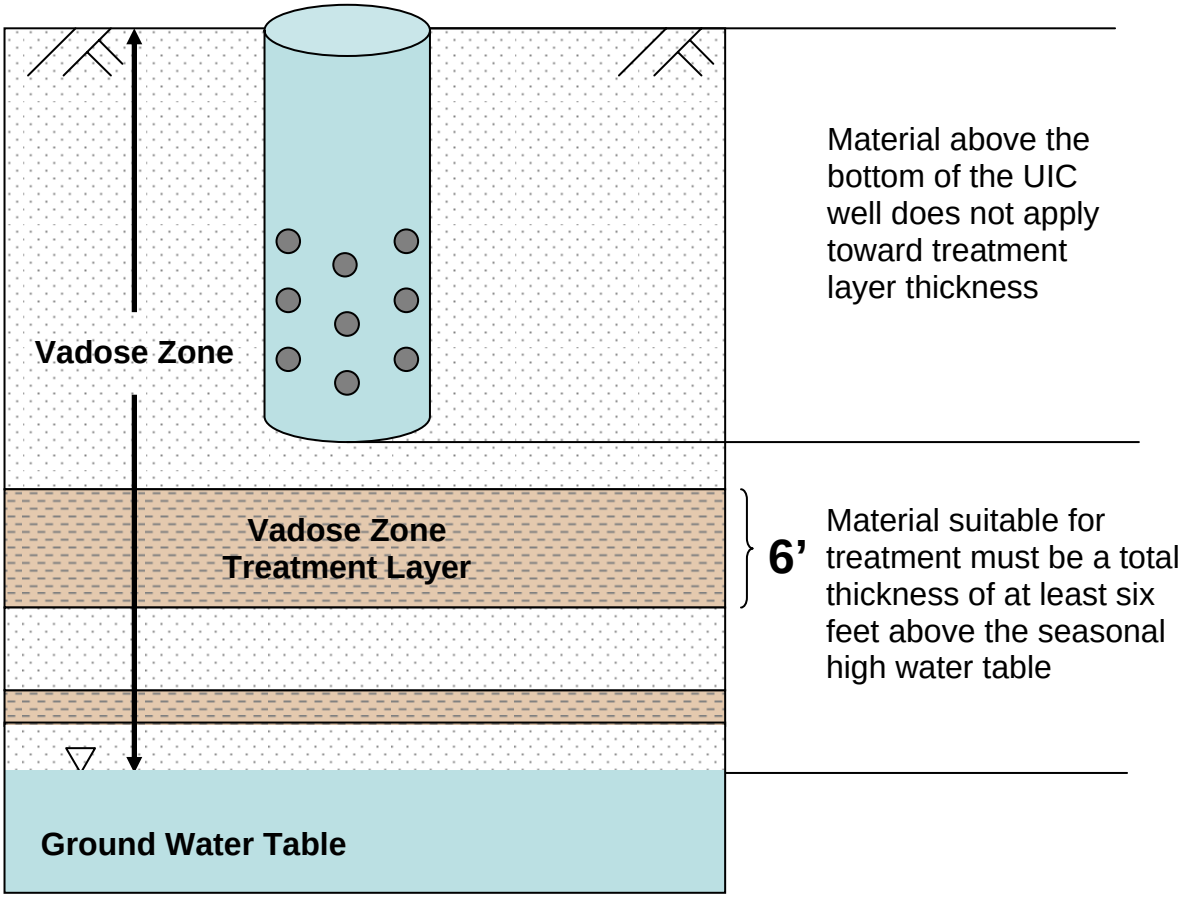


Figure 1: Schematic Vadose Zone Treatment Layer Example

Geologic materials that are classified as having a **high treatment capacity** are fine-grained with a greater capacity to filter discharges. These materials also tend to remove pollutants by chemical reactions such as cation exchange capacity and sorption. These may be mixtures of materials where silt and clay fill the void spaces in the matrix of the coarser materials. More compaction results in better filtration. High treatment capacity layers must total a minimum of six feet between the bottom of the UIC well and the seasonal high water table.

Geologic materials that are classified as having a **medium treatment capacity** provide moderate to high filtration and have minor or no chemically reactive characteristics. Medium treatment capacity layers must total a minimum of ten feet

Geologic materials that are classified as having a **low treatment capacity** provide some minimal filtration. Although the sand and gravel mixtures in this category may provide moderate filtration when the UIC well is initially installed, preferential flow paths develop that reduce this capacity. Low treatment capacity layers must total a minimum of 25 feet between the bottom of the UIC well and the seasonal high water table.

Geologic materials that are classified as having **no treatment capacity** do not provide filtration to remove pollutants. Since this type of material does not have treatment capacity, pre-treatment is always required except for sites in that are classified as having an insignificant pollutant load in Table 7.3.

### 7.7.2 Vadose Zone Materials

In most cases, site exploration will be required to obtain sufficient data to determine the treatment capacity of the vadose zone materials using Table 7.2, particularly where reliable regional information or nearby borehole logs are not readily available.

In some cases, geologic information may be available from regional geology maps in publications from the Department of Natural Resources or U.S. Geological Survey, from a well borehole log(s) in the same quarter-section on the Department of Ecology website, or from local governments.

The following should be kept in mind when using these sources.

- Surface soils maps generally do not provide adequate information, although the parent material information provided may be helpful in some locations.
- Well borehole log locations should be verified, as electronic data bases contain many errors of this type.
- When using borehole logs, a "nearby" site is generally within a quarter of a mile and preferably within 50 to 500 feet, depending on the heterogeneity of the region
- Subsurface geology can vary considerably in a very short horizontal distance in many areas of the state, so professional judgment should be used to determine whether the available data are adequate or site exploration is necessary.

Alternatively, for small projects where site exploration is not cost-effective, a design professional might apply a conservative design approach subject to the approval of the local jurisdiction.

### 7.7.3 Depth to Ground Water

The minimum required separation between the bottom of the facility and the highest seasonal water table depends upon the characteristics of the vadose zone, the potential for mounding of infiltrating stormwater above the water table, and the degree of certainty of available data as to the seasonal high water table elevation.

Knowledge of the seasonal high water table is especially important for siting UIC wells in areas with very shallow water tables (seasonal high water table less than fifteen feet below the bottom of the UIC well).

Significant mounding of infiltrating stormwater can occur above the water table (Appleyard, 1993) and UIC wells must not discharge stormwater directly into ground water at any time (except for perched lenses). This applies even if the groundwater level is rising in response to the UIC discharge.

Water level information is also needed to confirm the thickness of the treatment layer in the vadose zone between the bottom of the UIC well and the highest known groundwater level.

Groundwater depths may be available from the following sources.

- Site exploration
- Department of Ecology
- Department of Natural Resources
- U.S. Geological Survey publications
- Local governments

Water level data associated with a single borehole log may be insufficient to determine the seasonal high water table. This is especially true if drilling followed a wet season with lower than normal precipitation or occurred outside of the season when water tables are normally the highest. Seasonal high water tables generally occur during late winter through mid-spring in most of Washington State. In heavily irrigated areas, the seasonal high water table elevation may occur in late summer.

At sites where the fluctuation of the seasonal water table is large (several feet) or unknown, designers should err on the side of caution. UIC wells must not discharge stormwater directly into ground water.

### 7.7.4 Exceptions to Tables 7.1 through 7.3 based on site-specific or local studies

Exceptions to the tables may be made when:

- Local planning efforts generate an alternative method that meets the non-endangerment standard based on local conditions.
- More detailed site-specific data are gathered by the project proponent and local permission is granted under a locally developed stormwater management program.

**When local planning efforts generate an alternative method**

Local planning may generate alternate methods that may be used instead of the one used in Table 7.2, Table 7.3 and Table 7.4. For example, local jurisdictions may choose to allow changes in the pollutant loading categories in Table 7.3 based on source control activities at a site. The local alternative method must meet the non-endangerment standard based on local conditions.

**When there is site-specific data and local permission is granted**

The minimum vadose zone treatment layer thicknesses listed in Table 7.2 may be changed to three feet for a high-capacity treatment matrix, and to six feet for a medium-capacity treatment matrix when the following requirements are met.

- The UIC well is regulated under a locally developed stormwater management program approved by the department, and the local authority approves the change in minimum thickness.
- The discharge is to a publicly-owned UIC well.
- The pollutant loadings are insignificant or low.
- Reliable on-site information is available. If local geology does not vary greatly, borehole logs within one-quarter mile of the proposed UIC well may be used.
- If the three feet of high-capacity treatment matrix provides the entire separation between the bottom of the structure and the seasonal high water table, site specific water level data must be collected to justify the minimal separation from the water table.
- The potential for mounding of infiltrating stormwater above the water table must be evaluated. If mounding is likely, then additional separation or pre-treatment is needed

### 7.7.5 Tables to Determine Pre-treatment Requirements for Solids, Metals and Oils

The following three tables help UIC well owners determine what pre-treatment is required for solids, metals, and oil. These tables may also be used at industrial sites where stormwater has no contact with industrial activities outdoors. In this case, a "no-exposure certificate" must be submitted.

- **Vadose Zone Conditions**: Table 7.2 categorizes the treatment capacity of the vadose zone beneath the UIC well. If vadose zone conditions are unknown, use "None" for treatment capacity.

- **Pollutant Loading:** Table 7.3 categorizes the amount of pollutant loading for solids, metals and oil in stormwater runoff that will be discharged to a UIC well.

- **Treatment:** Table 7.4 crosses Table 7.2 and Table 7.3 to give the appropriate treatment level for the vadose zone conditions and the expected pollutant loading.

**Table 7.2: Vadose Zone Conditions**

*These are the classification of conditions between the bottom of the UIC well and the top of the highest known seasonal water table used to determine whether the facility is exempt from the pre-treatment requirement when using Table 7.4. If vadose zone conditions are unknown, use "None" for treatment capacity.*

| Treatment Capacity Classification and Minimum Thickness | Description of Vadose Zone Layer |
|---|---|
| **HIGH**<br><br>A minimum thickness of six feet | ■ Materials with average grain size < 0.125 mm<br>■ Having a sand to silt/clay ratio of less than 1:1 and sand plus gravel < 50%<br>■ Lean, fat, or elastic clay<br>■ Sandy or silty clay<br>■ Silt<br>■ Clayey or sandy silt<br>■ Sandy loam or loamy sand<br>■ Silt/clay with inter-bedded sand<br>■ Well-compacted, poorly-sorted materials<br>■ This category generally includes till, hardpan, caliche, and loess |
| **MEDIUM**<br><br>A minimum thickness of ten feet | ■ Materials with average grain size 0.125mm to 4mm<br>■ Sand to silt/clay ratio from 1:1 to 9:1 *and* percent sand > percent gravel<br>■ Fine, medium or coarse sand<br>■ Sand with interbedded clay and/or silt<br>■ Poorly-compacted, poorly-sorted materials<br>■ This category includes some alluvium and outwash deposits |
| **LOW**<br><br>A minimum thickness of twenty five feet | ■ Materials with average grain size > 4mm to 64mm<br>■ Having a sand to silt/clay ratio greater than 9:1 and percent sand less than percent gravel<br>■ Poorly-sorted, silty or muddy gravel<br>■ Sandy gravel, gravelly sand, or sand and gravel<br>■ This category includes some alluvium and outwash deposits |
| **NONE**<br><br>Minimum thickness not applicable | ■ Materials with average grain size >64mm<br>■ Having total fines (sand and mud) less than 5%<br>■ Well-sorted or clean gravel<br>■ Boulders and/or cobbles<br>■ Fractured rock<br>■ This category generally includes fractured basalt, other fractured bedrock, and cavernous limestone |

**Table 7.3: Pollutant Loading Classifications for Solids, Metals, and Oil in Stormwater Runoff Directed to UIC Wells.**

*These are the categories of pollutant loadings used to determine whether the facility is exempt from the pre-treatment requirement when using Table 7.4.*

| Classification | Areas Contributing Runoff to the UIC Well (ADT = Average Daily Traffic) |
|---|---|
| **Insignificant** | ■ Impervious surfaces not subject to motorized vehicle traffic or application of sand or deicing compounds<br>■ Un-maintained open space |
| **Low** | ■ Parking areas with <40 trip ends per 1,000 SF of gross building area or <100 total trip ends<br>■ Other land uses with similar traffic/use characteristics (e.g. most residential parking and employee-only parking areas for small office parks or other commercial buildings)<br>■ **Inside Urban Growth Management Areas**<br>o Fully controlled and partially controlled limited access highways with ADT less than 15,000<br>o Other roads with ADT less than 7,500 vehicles per day<br>■ **Outside Urban Growth Management Areas**<br>o All roads with ADT less than 15,000 vehicles per day |
| **Medium** | ■ Parking areas with between 40 and 100 trip ends per 1,000 SF of gross building area or between 100 and 300 total trip ends<br>■ Primary access points for high-density residential apartments<br>■ Intersections controlled by traffic signals that do not meet the definition of a high-density intersection (see Glossary)<br>■ Transit center bus stops<br>■ Other land uses with similar traffic/use characteristics (e.g. visitor parking for small to medium commercial buildings with a limited number of daily customers)<br>■ **Inside Urban Growth Management Areas**<br>o Fully controlled and partially controlled limited access highways with ADT between 15,000 and 30,000 vehicles per day<br>o Other roads with ADT between 7,500 and 30,000 vehicles per day<br>■ **Outside Urban Growth Management Areas**<br>o All roads with ADT between 15,000 and 30,000 vehicles per day |
| **High** | ■ All roads with ADT >30,000 vehicles per day<br>■ High-density intersections<br>■ Parking areas with >100 trip ends per 1,000 SF of gross building area or >300 total trip ends<br>■ On-street parking areas of municipal streets in commercial and industrial areas<br>■ Highway rest areas<br>■ Other land uses with similar traffic/use characteristics (e.g. commercial buildings with a frequent turnover of visitors, such as grocery stores, shopping malls, restaurants, drive-through services, etc.) |

**Table 7.4: Pre-treatment required for Solids, Oil and Metals.**

*Find the Treatment Capacity Classification from Table 7.2 and the Pollutant Loading Classification from Table 7.3. Use Table 7.4 to determine the pre-treatment requirements for solids, oil, and metals based on these classifications. Pre-treatment technologies for solids, oil, and metals removal are provided by the Deptartment of Ecology stormwater manuals.*

| **Treatment capacity** / **Pollutant loading** | *High* | *Medium* | *Low* | *None* |
|---|---|---|---|---|
| *Insignificant* | None | None | None | None |
| *Low* | None | None | None | Remove solids[2] |
| *Medium* | Two-stage drywells[1] | Two-stage drywells[1] | Remove solids[2] | Remove solids[2] |
| *High* | Remove oil[3] | Remove oil[3] | Remove oil and solids[2,3] | Remove oil and solids[2,3] |

[1] A **two-stage drywell** is a catch basin or other pre-settling/spill control structure that traps small quantities of oils and solids. The catch basin or other pre-settling/spill control device must be inspected and cleaned regularly (see the operation and maintenance requirements in Ecology stormwater management manuals).

[2] **Treatment to remove solids** means basic treatment as defined in the Glossary. Removal of solids should remove a large portion of the metals in most stormwater runoff. Any special treatment requirements in this chapter still apply. For **low** pollutant loading sites, implementation of appropriate source control BMPs may be employed in lieu of structural treatment BMPs (see Ecology stormwater management manuals).

[3] **Treatment to remove oil** means applying one of the separation or adsorption technologies identified in the Department of Ecology stormwater management manuals.

At high-density intersections and at commercial or industrial sites subject to an expected average daily traffic count (ADT) of 100 vehicles/1,000 ft² gross building area, sufficient quantities of oil will be generated to justify operation of a separator BMP.

At other high-use sites, project proponents may select a basic runoff treatment BMP that also provides adsorptive capacity, such as a biofiltration or bioinfiltration swale, a filter or catch basin insert, or other adsorptive technology, in lieu of a separator BMP.

# Chapter 8 – Bibliography

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# Chapter 9 – Glossary

| | |
|---|---|
| All known and reasonable treatment (AKART) | All known, available, and reasonable methods of prevention, control, and treatment. The most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. The concept of AKART applies to both point and nonpoint sources of pollution. Best Management Practices (BMPs) typically applied to nonpoint source pollution controls are considered a subset of the AKART requirement. The Stormwater Management Manual for Eastern Washington may be used as a guideline, to the extent appropriate, for developing best management practices to apply AKART for stormwater discharges. AKART and Best Available Treatment (BAT) are roughly equivalent state and federal terms for the same concept. |
| Average daily traffic (ADT) | The average daily traffic is an estimate of how many cars use a roadway in a day, on average. Average daily traffic counts are generated when roadways are designed.<br><br>ADT count estimates may be obtained from:<br>1. The document ***Trip Generation*** **(**Institute of Transportation Engineers)<br>2. A traffic study prepared by a professional engineer<br>3. A transportation specialist with expertise in traffic volume estimation.<br><br>Where used for UIC projects, ADT counts are to be estimated for twenty years after project completion. For project sites with seasonal or varied use, evaluate the highest period of expected traffic impacts. |
| Basic treatment | Treatment of stormwater with the goal of removing at least 80 percent of the solids present in the runoff using one of the treatment facilities or methods identified in Ecology stormwater management manuals. Basic treatment is required for all discharges where removal of solids is identified as a requirement. Additional treatment to remove metals, oil or phosphorus may be required at some sites or for some receiving water bodies. |
| Design storm | A prescribed hyetograph or precipitation distribution, and the total precipitation amount for a specific duration recurrence frequency. The design storm is used to estimate runoff for a hypothetical rainstorm of interest or concern for the purposes of analyzing existing drainage, designing new facilities, or assessing other impacts of a proposed |

project on the flow of surface water. Different design storms are described for eastern and western Washington in Ecology stormwater management manuals.

High-use sites

High-use sites generate high concentrations of oil either because of a high traffic turnover or the frequent transfer of oil and other petroleum products. These sites generate enough oil to be effectively removed with treatment. A high-use site is any one of the following.

- High-density road intersections with an expected ADT of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway. This does not include improvements that are primarily for pedestrian or bicycle use.
- Commercial or industrial sites with an expected trip end count equal to or greater than 100 vehicles per 1,000 square feet of gross building area.
- Customer or visitor parking lots with an expected trip end count equal to or greater than 300 vehicles.
- Commercial on-street parking areas on streets with an expected total ADT count equal to or greater than 7,500.
- Fueling stations and facilities.
- Petroleum storage and transfer in excess of 1,500 gallons per year at commercial or industrial sites.

  This includes heating fuel handling and storage facilities. This does not include locations where heating fuel is routinely delivered to end users.
- Fleets of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.) used, stored, or maintained at commercial or industrial sites.
- Maintenance and repair facilities for vehicles, aircraft, construction equipment, railroad equipment, or industrial machinery and equipment.
- Outdoor areas where hydraulic equipment is stored.
- Log storage and sorting yards and other sites subject to frequent use of forklifts and (or) other hydraulic equipment.
- Railroad yards.

■ •

Metals treatment

Treatment of stormwater with the goal of removing dissolved metals in the runoff by applying one of the technologies identified in Ecology stormwater management manuals.

| | |
|---|---|
| Non-endangerment | To prevent the movement of fluid containing any contaminant into the ground water if the contaminant many cause a violation of the *Water Quality Standards for Ground Waters of the State of Washington,* or may cause health concerns. (See Chapter 173-218 WAC Underground Injection Control Program) |
| Oil control | Treatment of stormwater with the goal of removing oil by applying one of the separation or adsorption technologies identified in Ecology stormwater management manuals. At high-density intersections and at commercial or industrial sites subject to an expected average daily traffic count (ADT) ≥100 vehicles/1,000 ft² gross building area, sufficient quantities of oil will be generated to justify operation of a separator BMP (see Ecology stormwater management manuals). At other high-use sites, project proponents may select a basic runoff treatment BMP that also provides adsorptive capacity, such as a biofiltration or bioinfiltration swale, a filter or catch basin insert, or other adsorptive technology, in lieu of a separator BMP. |
| Poorly-sorted | The grain size distribution of a solid material composed of a mixture of grain sizes. |
| Solids removal | Structural pre-treatment of stormwater using any of the methodologies in Ecology stormwater management manuals that are intended to provide for removal of at least 80 percent of the particles in the runoff by settling and/or filtration. Called "basic treatment" in Ecology stormwater management manuals. |
| Source control | A structure or operation intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. See Chapter 8 of the *Stormwater Management Manual for Eastern Washington* (Ecology Publication # 04-10-076) or Volume IV of the *Stormwater Management Manual for Western Washington* (Ecology Publication # 99-14). |
| Stormwater management program (SWMP) | A combination of stormwater management activities planned and implemented by a local jurisdiction to reduce pollutants in urban runoff and protect water quality in the receiving waters. A SWMP may also be called, or include, a UIC management plan developed by the local government. |
| Stormwater treatment | Use of a structural BMP or the vadose zone below a UIC well to remove pollutants from stormwater. |
| Well-sorted | The grain size distribution of a solid material composed of grains of the same size. |

# Appendix A – Benchmark Monitoring of Runoff for Nitrate, Nitrite, Ammonia or Phosphorus for Certain Industrial Activities

EPA rules (40 CFR 122.26(b)(14)) require benchmark monitoring of runoff for nitrate, nitrite, ammonia or phosphorus for certain industrial activities, as follows:

- Facilities subject to stormwater effluent limitations guidelines, or new source performance standards specified in 40 CFR Subchapter N, or Toxic Pollutant Effluent Standards under 40 CFR Subchapter D.

- Facilities listed under the following Standard Industrial Classifications (SIC):

| | |
|---|---|
| 24xx | Lumber and Wood Products (except 2434 - Wood Kitchen Cabinets, see Category 11) |
| 26xx | Paper and Allied Products (except 265 - Paperboard Containers; and 267 - Converted Paper and Paperboard Products, see Category 11) |
| 28xx | Chemicals and Allied Products (except 283 - Drugs; and 285 Paints, Varnishes, Lacquers, Enamels, and Allied Products, see Category 11) |
| 29xx | Petroleum and Coal Products, (except 2951 - Asphalt Concrete Plants, must apply for the sand and gravel general permit) |
| 311x | Leather Tanning and Finishing |
| 32xx | Stone, Clay and Glass Products (except 323 - Glass Products made from purchased glass, see category 11) and (except 3273 - Ready-Mixed Concrete, must apply for the sand and gravel general permit) |
| 33xx | Primary Metals Industries |
| 3441 | Fabricated Structural Metal |
| 373x | Ship and Boat Building and Repairing |
| 10xx | Metal Mining |
| 12xx | Coal Mining |
| 13xx | Oil and Gas Extraction |
| 14xx | Mining and Quarrying of Nonmetallic Minerals, except Fuels (except 1411 - dimension stone; 1422 - Crushed and Broken Limestone; 1423 - Crushed and Broken Granite; 1429 - Crushed and Broken Stone, Not Elsewhere Classified; 1442 - Construction Sand and Gravel; 1446 - Industrial Sand, 1445 - Kaolin and Ball Clay; 1459 - Clay, Ceramic, and Refractory Minerals, Not Otherwise Classified; 1499 - Miscellaneous Nonmetallic Minerals, Except Fuels; must apply for the sand and gravel general permit) |

- Hazardous waste treatment, storage, or disposal facilities, including those operating under interim status or a permit under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

- Landfills, land application sites, and open dumps that receive or have received any industrial wastes (waste that is received from any of the facilities described in this appendix) including those subject to regulation under Subtitle D of RCRA.

- Recycling facilities, facilities involved in the recycling of materials, including metal scrapyards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093.

- Steam electric power generating facilities, including coal handling sites.

- Transportation facilities classified under SICs below, which have vehicle maintenance shops, equipment cleaning operations, or airport deicing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling and lubrication), equipment cleaning operations, airport deicing operations or which are otherwise identified under one of the other 11 categories of industrial activities listed in this appendix are associated with industrial activity.

| | |
|---|---|
| 40xx | Railroad Transportation |
| 41xx | Local and Interurban Passenger Transportation |
| 42xx | Motor Freight Transportation and Warehousing (except 4221Farm Product Warehousing and Storage; 4222 Refrigerated Warehousing and Storage; and 4225 General Warehousing and Storage; see Category 11) |
| 43xx | United States Postal Service |
| 44xx | Water Transportation |
| 45xx | Transportation by Air |
| 5171 | Petroleum Bulk Stations and Terminals |

- Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge, that are located within the confines of the facility, with a design flow of one million gallons per day or more, or required to have an approved pretreatment program under 40 CFR Part 403. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and which are not physically located in the confines of the facility, or areas that are in compliance with Section 405 of the CWA.

- Facilities under the following standard industrial classifications:

| | |
|---|---|
| 20xx | Food and Kindred Products |
| 21xx | Tobacco Products |
| 22xx | Textile Mill Products |

| | |
|---|---|
| 23xx | Apparel and Other Textile Products |
| 2434 | Wood Kitchen Cabinets |
| 25xx | Furniture and Fixtures |
| 265x | Paperboard Containers and Boxes |
| 267x | Converted Paper and Paperboard Products |
| 27xx | Printing, Publishing and Allied Industries |
| 283x | Drugs |
| 285x | Paints, Varnishes, Lacquers, Enamels, and Allied Products |
| 30xx | Rubber and Miscellaneous Plastic Products |
| 31xx | Leather and Leather Products (except 311 Leather Tanning and Finishing, see Category 2) |
| 323x | Glass Products Made of Purchased Glass |
| 34xx | Fabricated Metal Products (except 3441 Fabricated Structural Metal, see Category 2) |
| 35xx | Industrial and Commercial Machinery and Computer Equipment |
| 36xx | Electronic and Other Electrical Equipment |
| 37xx | Transportation Equipment (except 373 Ship and Boat Building and Repair, see Category 2) |
| 38xx | Measuring, Analyzing, and Controlling Instruments, Photographic, Medical and Optical Goods; Watches and Clocks |
| 39xx | Miscellaneous Manufacturing Industries |
| 4221 | Farm Product Warehousing and Storage |
| 4222 | Refrigerated Warehousing and Storage |
| 4225 | General Warehousing and Storage |

# Appendix B – Report a Spill

Washington State Department of Ecology : Spills Home

## How to Report a Spill

**Spills of oil or hazardous materials must be reported.**

***Who to Call***

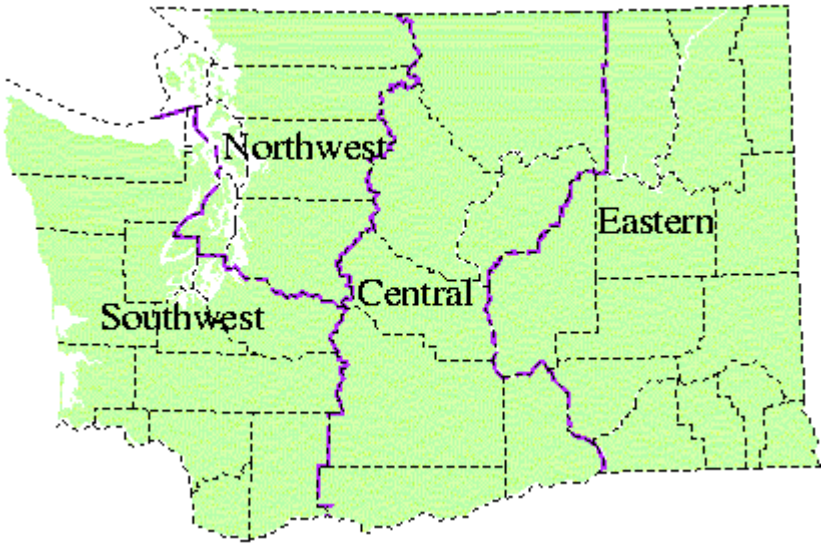
**National Response Center: 1-800-424-8802**

**AND**

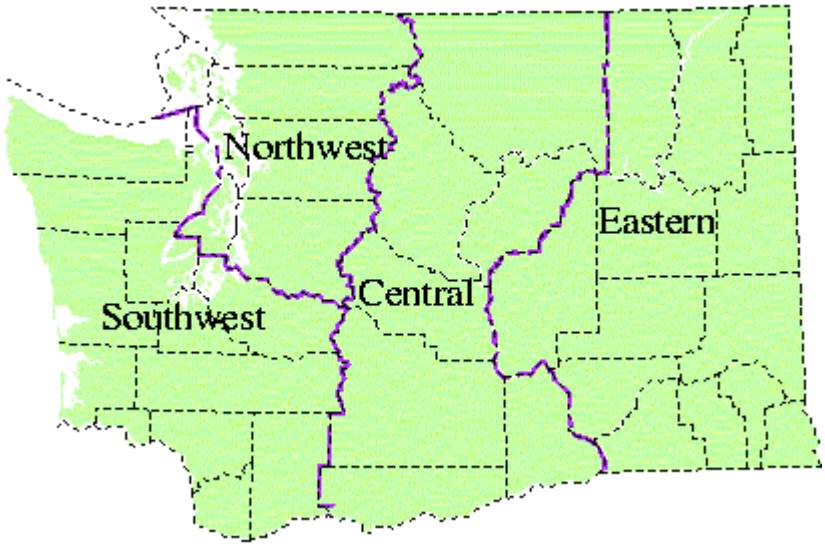
**Washington Emergency Management Division: 1-800-258-5990 OR 1-800-OILS-911**

**AND**

**Appropriate Ecology regional office:**




**Northwest Region: 1-425-649-7000**
(Island, King, Kitsap, San Juan, Skagit, Snohomish, and Whatcom counties)
**Southwest Region: 1-360-407-6300**
(Clallum, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, and Wahkiakum counties)
**Central Region: 1-509-575-2490**
(Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, and Yakima counties)
**Eastern Region: 1-509-329-3400**
(Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, and Whitman counties)




***Useful Information***

**NOTE:** ***You may request that your personal information be kept confidential.***

To the best of your ability, please be ready with the following information:

- Where is the spill?
- What spilled?
- How much spilled?
- How concentrated is the spilled material?
- Who spilled the material?
- Is anyone cleaning up the spill?
- Are there resource damages (e.g. dead fish or oiled birds)?
- Who is reporting the spill?
- How can we get back to you?

# Appendix C – Registration Forms